

# EFFICIENCY AND SUSTAINABILITY QUESTIONS OF THE AGRICULTURAL PRODUCTION IN KOSOVO

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The paper focuses on comparing the economic features of the EU-28 and agricultural industry of Kosovo and also economic and agricultural conditions with some neighbouring countries based on the statistical analyses in the period of 2012 and 2016. Generally, it can be declared that in Kosovo the employment in agriculture is at a very highly level accompanied with less developed machinery level, in spite of the inflation rate at a low level with high portion of the agricultural land of total land area compared to the cases of other neighbouring countries. The international competitiveness of farmers needs for developing the mechanization is accompanied with increasing subsidies for farmers. The lack of capital, less educated and skilled employees in agricultural industry result into some economic difficulties for the further prosperity of the sector in Kosovo. The possible solutions for the agricultural industry in Kosovo are developing the mechanization, common selling-purchasing of farmers, more activities in agricultural services, secondary activities, increasing the subsidies for farmers, attracting farmers for food manufacturing industries, extending the agricultural advisory network and creation of better credit conditions for farmers.

**Keywords:** EU-28; employment; mechanization; subsidies

## Introduction

The study focuses on the efficiency issues of the agricultural sector in Kosovo accompanied with unfavourable economic difficulties of this sector based on some comparisons with the EU-28 and neighbour countries, for example Albania, Bosnia-Herzegovina, North-Macedonia and Serbia. The data base is from international sources, such as the European Commission, FAO, the World Bank, and national published materials in Kosovo.

Some international and national organizations (EFSE, 2018) declared that main economic difficulties of agricultural industry in Kosovo needed for their improvement are as follows:

- about 30–40% of land owners are estimated to be absent, because they either migrated to urban areas or abroad;
- rationalization and consolidation of physically separated parcels of land requiring reallocation among landholders, though this process is slow and burdensome;
- collaboration among farmers in Kosovo is weak;
- co-operation among farmers in the field of horizontal integration, and also among farmers and manufacturing processors or traders in the field of vertical integration remain at minimal level in Kosovo;
- effective co-operatives of farmers are currently rather at the low level, only there are some co-operatives and associations in crop production, which represent only a small percentage of farmers;
- the capacity of existing co-operatives is weak;
- small and medium scale farmers need more experience and knowledge in field of agricultural and rural lending;
- high interest rates and requirements of banks are considerable burdens on farmers;
- insufficient technical skills, business and financial knowledge of farmers;
- financial institutions make financial background difficult for the farmers;

- there is a strong need for long-term loans to finance more agricultural machinery, storage facilities, greenhouses and planting new orchards, as well as equipment and consumption of fixed capital for agricultural basic production and manufacturing process;
- difficulties of agricultural industry and the various risks of agricultural production can increase burdens for farmers;
- by tailoring financial products and services with innovative features and increasing efficiency, the cost of delivery can be at lower level;
- to be more profitable, agricultural producers can improve their financial literacy and agricultural knowledge to better identify opportunities;
- agricultural finance needs for setting up adequate business mode, which addresses key issues in fields of service, production and marketing leading to better knowledge of farmers, which are obligatory to arrange risk management, improve risk assessment and operational efficiency by lower delivery costs.

Hauser et al. (2016) with some other experts could declare and describe the macroeconomic conditions of Kosovo, which are as follows:

1. unemployment rate is at a very highly level;
2. GDP per capita is about EUR 3,000 and just over a quarter of the population is employed, therefore, Kosovo has a major need for SME (Small and Medium Enterprises) development in order to provide jobs and increase local production to correct its negative trade deficit, namely 35.3%;
3. SME sector consists of traditional and non-innovative enterprises, which have performed well in terms of ability to generate jobs, with over 80% of employment provided by SMEs;
4. on the one hand, business planning, financial record keeping, and growth management is lacking, creating a barrier for lending with lower collateral requirements and equity finance;
5. most of SMEs of Kosovo wish to retain their family-owned business structures and the demand for equity finance is low.

The above-mentioned experts proposed the launch of a new national credit guarantee fund and investigation of the need for additional capital for the existing fund in order to reduce the further collateral requirement burden on SME borrowers (Hauser et al., 2016).

Also, the farmers in Kosovo need adequate financial subsidies and credit possibilities for improving their agricultural production, while the last one also needs for setting up a well operating bank system for realising this aim. This bank system is operating under the internal control (Lentner et al., 2019). Naturally, the convergence in central banking regulation is requested by the EU to create an internationally unified bank system in Europe (Lentner, 2018).

Additionally, as for the financial background of farming in order to enable farmers decrease the cost of production and their transaction cost, they are stimulated to strengthen their cooperation for accessing cheaper inputs (Popp et al. 2019; Angeloska et al., 2018; Széles et al., 2014) and improving the agricultural productivity even in Kosovo (Shaqiri and Trendov, 2018). The new technology should be used even in the field of digital development trends for improving the agricultural sector (Trendov et al., 2019).

## Material and methods

The study focuses on comparing the economic features of the EU-28 and agricultural industry of Kosovo. The researched fields of the comparison focus on the output of agricultural industry, agricultural production and services, secondary activities, intermediate consumption, agricultural gross value added and income conditions. The data bases are based on the source of Eurostat and KAS (Ministry of Agriculture, Forestry and Rural Development) concerning the Economic Accounts for Agriculture, developed by DEAA5-MAFRD (Table 1) (Eurostat, EAA, 2018) (dataset aact\_ali01) (aact\_eaa01) (Table 2).

Also, economic and agricultural conditions of Kosovo are to be compared with agricultural features of some neighbouring countries of Kosovo, namely Albania, Bosnia-Herzegovina, North-Macedonia and Serbia based on the SPSS (Statistical program for social sciences) in the period of 2012 and 2016. This statistical system compares population, inflation, personal remittances received, agricultural machinery, fertilizer consumption, agricultural valued added, employment in agricultural sector and shares of the agricultural lands and arable lands on total land areas in researched countries (Table 3). The data come from the World Bank, (World Bank 2019a; World Bank 2019b), as World Development Indicators, and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013 (Table 3).

This SPSS statistical system was worked out by Argyrous (2005). The SPSS system provides the similarities and differences as measures of correlations among economic features, as economic variances of EU-28 member states, and neighbouring countries of Kosovo.

The study analyses the correlations among ten economic variables: PoPul1 (Population in thousands), GDP2 (GDP per capita at constant 2010 US Dollar), Inflation3 (Inflation), Remittance4 (Personal remittances received in current USD in billion), Machinery5 (Agricultural machinery, tractors per 100 sq. km of arable land), Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land), AGVA7 (Agriculture, value added in % of GDP), Employment8 (Employment in agriculture in % of total employment), AgrLand9 (Agricultural land in % of land area) and the ArableLand10 (Arable land in % of land area) (Table 4).

Additionally, in order to draw correlations, the SPSS system provides the possibility for analysing the economic features of the researched countries in fields of dimension reduction for factor analyses using principle components, rotated components, and factor score by using graphs (Figure

**Table 1** Main components of agricultural industry in EU-28, 2010–2016

Titles	2010 (million EUR)	2015 (million EUR)	2016 (million EUR)	Change 2010–2016 (%, 2010 = 100%)	Share in output value of the agricultural industry, 2016 (%)
Output of agricultural industry	372,902	416,719	405,008	8.6	100.0
Crop output	188,875	215,686	210,282	11.3	51.9
Animal output	142,345	164,342	158,873	11.6	39.2
Agricultural services	17,693	20,317	20,104	13.6	5.0
Secondary activities	23,989	16,373	15,750	-34.3	3.9
– intermediate consumption (input)	217,309	247,658	239,355	10.1	59.1
Gross value added	155,593	169,060	165,654	6.5	40.9
– consumption of fixed capital	69,401	61,141	60,803	-5.4	–
– tax on production	–	5,601	4,877	–	–
+ subsidies on production	50,917	50,477	52,628	3.4	–
= factor income (2010 = 100%)	137,109	152,796	152,603	11.3	–
Growth rate (%)	100.0	11.4	11.3	–	–

Source: Eurostat, 2018. EAA (Economic Account for Agriculture, 2018) – dataset aact\_ali01 and aact\_eaa01

Note: Production value at basic price, 2010 = 100%; volume index for labour costs – change in total labour input measured in 1 000 AWU (annual working unit) (Eurostat 2018); correction of the weight for labour costs to cover the family labour costs – the compensation of employees is divided by the share of paid labour also directly available from the EAA (Eurostat 2018); the Farm Accountancy Data Network to estimate the national average depreciation rate; TFP (total factor productivity) index is defined as the ratio between an output index (i.e. the change in production volumes over a considered period) and an input index (the corresponding change in inputs/factors used to produce them), the four considered production factors (intermediate inputs, land, labour, capital) Agricultural factor income measures the remuneration of all factors of production (land, capital, labour) regardless of whether they are owned or borrowed/rented and represents all the value generated by a unit engaged in an agricultural production activity. It corresponds to the net value added at factor costs

Data extracted on 18/12/2019 20:05:30 from (ESTAT)

Output of the agricultural industry – basic and producer prices (TAG00102)

Production value at basic price (PROD\_BP) Million euro (MIO\_EUR)

**Table 2** Economic accounts for agriculture at current prices in Kosovo between 2012–2017 in Million Euro

Sectors	2012	2016	2017	2017/2012 (2010 = 100)
Total plant products	327.6	412.3	402.5	22.8
Total livestock products	266.6	302.4	298.4	12.0
Total livestock and plant products	594.2	714.7	700.9	18.0
Agricultural services	14.5	22.1 (3%)	22.3 (3%)	53.8
Total agricultural products	608.7	736.8 (100%)	732.2 (100%)	20.3
- Total intermediate consumption	218.3	247.4 (33.6%)	259.5 (35.4%)	20.5
Gross value added at base price	390.3	489.3 (66.4%)	463.7 (64.6%)	18.8
- Consumption of fixed capital	84.5	102.6	105.4	24.7
- Tax	4.2	2.1	3.0	-28.6
+ Compensation of employees	4.2	3.0	3.0	-28.6
Net value added at base price	305.8	387.6	358.3	17.2
Factor revenue	305.8	387.6	358.3	17.2

Source: KAS (Ministry of Agriculture, Forestry and Rural Development, 2018): Economic Accounts for Agriculture, developed by DEAAS-MAFRD p. 50. Green Report. Pristina, Kosovo

**Table 3** Comparison of Kosovo and its peers (selected indicators) 2016–2019

Indicator	Albania	Bosnia and Herzegovina	Kosovo	North-Macedonia	Serbia
Population (Thousands) 2018 (PoPul1)	2,866	3,324	1,845	2,083	6,982
GDP per capita (at constant 2010 US Dollar) 2018 (GDP2)	5,075	6,056	4,194	5,394	6,880
Inflation, 2018 (Inflation3)	0.8	1.4	0.2	4.3	2.0
Personal remittances received (current USD bln) 2018 (Remittance4)	1.46	2.12	1.24	0.34	4.32
Agricultural machinery, tractors per 100 sq. km of arable land (Machinery5)	121.9 (2008)	322 (1996)	cc. 25 (2019)	1,243 (2007)	22 (2008)
Fertilizer consumption (kilograms per hectare of arable land) 2016 (Fertilizer6)	126	132	cc. 80	79	245
Agriculture, value added (% of GDP) (AGVA7)	18	8	12	11	9
Employment in agriculture (% of total employment), 2019 (Employment8)	38	16	35	16	17
Agricultural land (% of land area), 2016 (AgrLand9)	43.1	43.1	52	50.2	39.3
Arable land (% of land area) 2016 (ArableLand10)	22.6	20.0	27.6	16.5	29.7

Note: \* Includes only those formally employed. If subsistence farming is added, employment in agriculture is estimated to reach 35% of labour force

Source: World Bank, 2019: World Development Indicators

World Bank, 2019 and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013

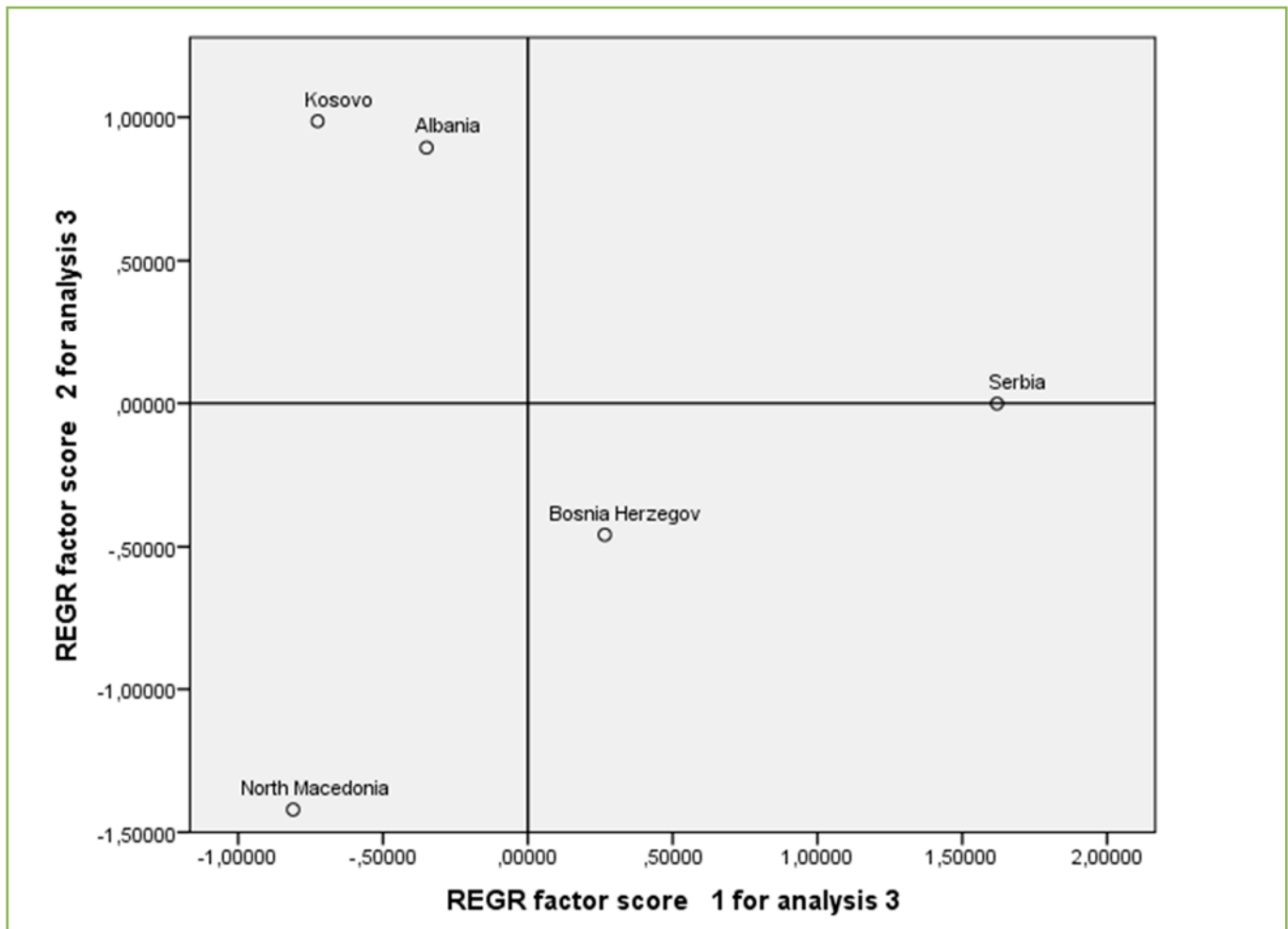
1). Also, the analysis contains hierarchical cluster system for clustering the countries based on their economic variances. Countries which have similar economic features are in a cluster (Figure 2) based on the clustering for Kosovo and its neighbour countries based on the dendrogram using Ward Linkage. These economic variables are the main economic features of the researched countries in order to show the measures of difference and similarity among these countries.

## Results and discussion

In order to compare the agricultural industry with conditions of the EU, it is important to summarize some agricultural issues in the EU (AFI, 2017; FADN 2018). Trends in output value, input value and gross value added (GVA) in the EU in 2010–2017 have been important for development of agricultural industry for this period. This correlation among these economic agricultural factors shows the structure of the agricultural performance and the increase.

Also, the agricultural gross value added is a good and successful initiating point from the basic agricultural production in direction to calculate the possible income conditions for farmers by the factor income. This income condition can keep the farmers to continue their economic activities in the agricultural sector and not to give up this once and not to leave their original places from rural and village areas to urban areas.

The CAP of the EU follows the difficulty and income conditions of farmers and AWU (annual working unit), the last one summarizing all of the employed workers and employees of the agricultural sector as full-time employee equivalent. The EU overviews their income positions from the point of view of the Agricultural factor income. Differences in general price levels are taken into account, the picture changes significantly for individual countries. Many countries with high factor income per AWU have lower values in purchasing power standards (PPS), while those with low factor income per AWU have higher values in PPS (especially the Czech Republic, Slovakia, Hungary and Bulgaria). The gap between the highest and the lowest values is reduced



**Figure 1** Factor analyses: REGR factor score 1 and 2  
 Source: World Bank, 2019: World Development Indicators  
 World Bank, 2019 and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013

substantially – while a full-time farm worker in Romania generates about 8% of the nominal factor income that his/her counterpart in the Netherlands earns, this share increases to 17% once adjustments for price level differences have been made (AFI, 2017; FADN 2018).

There are two main sub indicators in EU-28 in percent between 2010 and 2017 in million euro, namely:

1. Index of the real income of factors in agriculture per annual work unit increased by 24.26% since 2010 by the end of 2019 in EU-28, index 2010 = 100.
2. Index of real net entrepreneurial income of agriculture per unpaid annual work unit has increased by 35.6% between 2013–2020 in EU-28, index 2010 = 100 (Eurostat 2020, [aact\_eaa06]).

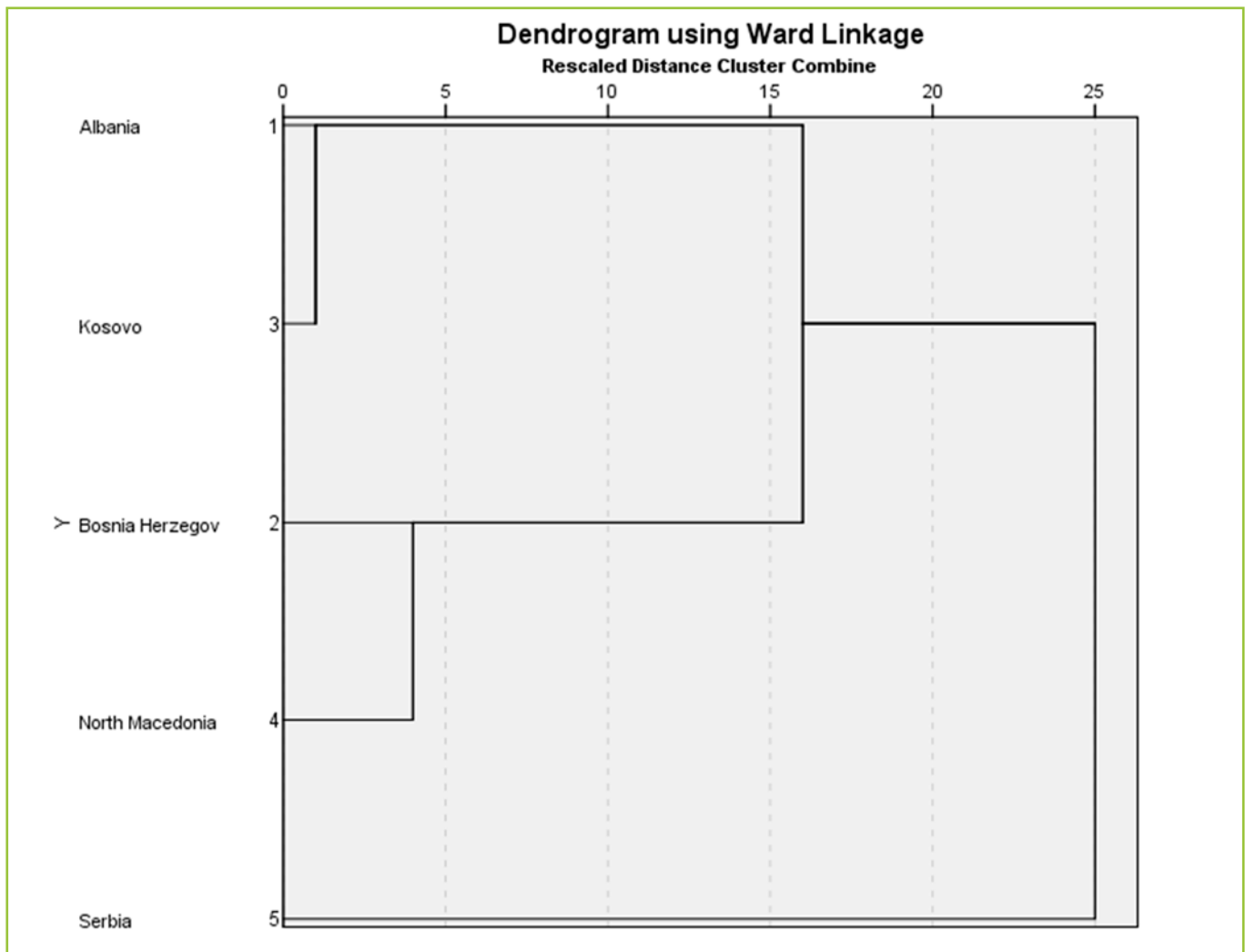
The EU ensured considerable subsidies for farmers, of which measure was comparably equal to 86.5% as a share of the consumption of the fixed capital in 2016 in EU-28. The increase of the agricultural gross value added in the EU has been by 6.5%, while the subsidies increased by 3.4% in inverse ratio of the decreasing rate of consumption of fixed capital and tax on production by 5.4% for the period of 2010–2016. All of these changes in the payments contributed to increase of the factor income for AWU (annual working unit) in EU-28. Therefore, the measure of subsidies has remained a considerable ratio comparably to measure of consumption of the fixed capital for the period of 2010 and 2016. These subsidies can ensure the modernization and

improvement of agricultural mechanization for farmers (Table 1) (aact\_ali01) (aact\_eaa01).

In Kosovo the agricultural value added has increased by 18.8% for the period of 2012–2016, while in EU-28 the agricultural value added has only increased by 6.5%. This difference could be affected by more extending agricultural production in Kosovo and with more favourable increased total arable land cultivated. Also, in Kosovo the GDP growth rate has increased by 3% for the researched period. My opinion is that in spite of the GDP growth in Kosovo being not quite considerable, this increase could ensure enough economic background for increasing the agricultural industry including the agricultural gross value added based on the increasing total area cultivated (Table 1 – Table 3) (KAS, 2018) (FAO, 2018).

In Kosovo in this statistical analysis the total area cultivated increase by 1.4% could make influences on the increase of the Human Development Index (HDI) (HDRO, 2018; UNDP 2018 and UNDP 2019). The increase of the total area cultivated can lead to the increase in price income of farming households, which could lead to the increase of the standard of living actually included in HDI. This increasing trend includes increase of the purchase power parity of the consumption of farmers and annual working units, which can be proved by increasing factor revenue by 17.2% (Table 2) (KAS 2018).

The above-mentioned reflects positive trends of economic growth including GDP and GVA increases in Kosovo, but there are some



**Figure 2** Clustering for Kosovo and its neighbouring countries based on the dendrogram using Ward Linkage

Source: World Bank, 2019: World Development Indicators

World Bank, 2019 and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013

important unfavourable economic conditions. From the point of view of the agricultural industry in Kosovo, the consumption of fixed capital has only 13.9% in 2012 and 14.4% in 2017 comparably to the total agricultural products (Table 2).

In the case of EU-28, the consumption of fixed capital has 15% comparably to the output of agricultural industry (Table 1) (dataset aact\_ali01 and aact\_eaa01). But in spite of the share of consumption of fixed capital closed to each other in EU-28 and Kosovo, the developed level of the mechanization in EU-28 is more advanced than in Kosovo. Also, in Kosovo, the agricultural production is very extensive, because the developed level of the mechanization is at a low level because of its backwardness which is considerable in international comparison. The age of the used agricultural machines is 35–40 year on average, based on the last estimated researched data from selected 106 farmers in 2019.

There is a considerable difference between Kosovo and EU-28 in the field of subsidies on production, because the value of the subsidies on production was 86.5% in 2016 comparably to the consumption of fixed capital in EU-28 (Table 1) (dataset aact\_ali01 and aact\_eaa01). In EU-28, considerable subsidies could make possibility to improve and develop the mechanization level.

But in case of Kosovo, the value of compensation of employees in agricultural sector was 2.85% in 2017 comparably to consumption of fixed

capital (Table 2) (KAS, 2018). This means that in Kosovo, the subsidies are at a very low level, which cannot provide enough financial bases to improve the mechanization. Also, according to the small share of the compensation comparably to the consumption of fixed capital, in Kosovo, the compensation of employees has decreased by 28.6%, which is the same as the decrease of tax. In essence, the tax decrease could be as the other kind for the increase of the compensation. In spite of farmers of Kosovo using fertilizers and soil improvers in 12.2% of fertilizers in the intermediate consumption, the EU-28 share was 7.3% in the same time. But farmers of Kosovo used less advanced agricultural machines and investments in their basic production (Table 2) (KAS, 2018). This means that the less advanced machines used by farmers of Kosovo are more costly than the highly advanced machines used by farmers in EU-28.

In Kosovo, this less advanced technology resulted in the decreasing wheat production value by 51.2 million euro in 2017 comparably it was less by 17.7%, as 11 million euro than in 2016 mostly by the same price (KAS, 2018). This means that the price income damage could be about 11 million euro from the difference in field of value of wheat between 2016 and 2017 within one year by the end of the 2017 for farmers of Kosovo. The decreasing yield in the value of wheat production was partly caused by the decreasing production area of the wheat. It would be useful for the farmers in Kosovo, that the central government can provide financial subsidies for the farmers of

Kosovo to cover partly the price income damages of them, which happened in the 2016–2017 years (Table 2) (KAS, 2018).

The production area of the cereals decreased by 12% for 2012–2017, but total cereal production increased by 9% in the same period because the yield of cereals in tons per hectare increased by 18.8%. The area of the cereals was caused by increasing production of vegetables and fruits. This affected the increase of total plant production and with the increase of total livestock production, which led to increase in the gross and net value added, and increase of factor revenue by 17% by the end of 2017. Therefore, the subsidies for agriculture decreased by mostly 30% and did not result in the decrease of the factor revenue of annual working units (AWUs) in Kosovo. The decrease of the subsidies for farmers in Kosovo resulted and remained the further less advanced level of the agricultural machines and agricultural technology, which will result the less competitiveness of farmers in Kosovo either in international market or even in the domestic market. In EU-28, the subsidies for farmers basically aim at developing the more advanced technology in order that the farmers can obtain more competitiveness at international market and national – single market of the EU-28 (KAS, 2018) (Table 1 and Table 2).

In EU-28, the agricultural services contributed by 5.0% share of the output of agricultural industry and additionally to this once also secondary activities had 3.9% share in output of agricultural industry. In inverse ratio of this once in Kosovo the agricultural services had only 3% in 2016 and 2017 years in spite of the fact that these services increased by 53.8% since 2010 by the end of 2017. But there were no other secondary activities of farmers, showing that the economic activities are not diversified, therefore, they could not obtain any plus incomes over the agricultural basic production in Kosovo. Less diversified activities resulted in less income for farmers (Table 1 and Table 2).

The average annual prices of retail (€/kg) of agricultural products decreased by 9.0%, while the annual average wholesale prices (€/kg) of agricultural products decreased by 5% for the period of 2012–2017 (KAS, 2018). This means that the prices were very pressed for the selling price of the farmers, which could decrease the adequate price income of farmers. This situation could occur because the farmers did not usually set up the product channel for the common selling products in order to keep higher prices and common purchasing inputs in order to keep lower price level for their interest. The selling channels of the agricultural products were kept by the wholesale

and partly by the retail traders. The less favourable price income conditions of the farmers led to less investment into their agricultural production.

According to the Table 3, which shows the basic data of population, inflation, personal remittances received, agricultural machinery, fertilizer consumption, agricultural valued added, employment in agricultural sector and shares of the agricultural lands and arable lands of total land areas in researched countries, the Table 4 shows the correlations among the economic variables. The very strong correlations are among the economic variables, if the correlation value is more than 0.800, strong correlations are between 0.600 and 0.800; middle strong correlations are between 0.500 and 0.600. The weak correlations are from 0.400 to 0.500. The correlations are not important under 0.400 value for the research and analyses.

If any economic variance has negative value in its correlation, this means that this is in verse ratio to the other economic variances. If this negative economic variance increases the other variances decrease or opposite that if any negative economic variance decreases the other variances increase. The values of the correlations are the same from diagonal line up-to right and down-to left.

According to the Table 4, the PoPul1 (Population in Thousands) has very strong correlations with GDP2 (GDP per capita at constant 2010 in US Dollar), Remittance4 (Personal remittances received in current USD billion), Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land) and in inverse ratio to the AgrLand9 (Agricultural land in % of land area).

PoPul1 (Population) has middle strong correlations with ArableLand10 (Arable land in % of land area) and weak correlation in inverse ratio to Machinery5 (Agricultural machinery, tractors per 100 sq. km of arable land) and Employment8 (Employment in agriculture in % of total employment).

GDP2 (GDP per capita at constant 2010 in US Dollar) has very strong correlations with Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land) and in inverse ratio to the AgrLand9 (Agricultural land in % of land area).

GDP2 has middle strong correlations with Remittance4 (Personal remittances received in current USD billion) and in inverse ratio to Employment8 (Employment in agriculture in % of total employment). GDP2 has weak correlations in inverse ratio to the AGVA7 (Agriculture, value added in % of GDP).

Inflation3 (Inflation) has very strong correlations with Machinery5 (Agricultural machinery, tractors per 100 sq. km of arable land) and has strong

**Table 4** Correlation Matrixa

	PoPul1	GDP2	Inflation3	Remittance4	Machinery5	Fertilizer6	AGVA7	Employment8	AgrLand9	ArableLand10
PoPul1	1,000	,866	,036	,962	-,402	,995	-,378	-,417	-,834	,575
GDP2	,866	1,000	,360	,771	-,021	,844	-,554	-,747	-,824	,111
Inflation3	,036	,360	1,000	-,212	,897	-,040	-,308	-,708	,103	-,602
Remittance4	,962	,771	-,212	1,000	-,608	,970	-,394	-,295	-,815	,705
Machinery5	-,402	-,021	,897	-,608	1,000	-,469	-,145	-,497	,429	-,835
Fertilizer6	,995	,844	-,040	,970	-,469	1,000	-,308	-,344	-,871	,597
AGVA7	-,378	-,554	-,308	-,394	-,145	-,308	1,000	,839	,110	-,041
Employment8	-,417	-,747	-,708	-,295	-,497	-,344	,839	1,000	,265	,306
AgrLand9	-,834	-,824	,103	-,815	,429	-,871	,110	,265	1,000	-,295
ArableLand10	,575	,111	-,602	,705	-,835	,597	-,041	,306	-,295	1,000

Source: World Bank, 2019: World Development Indicators

World Bank, 2019 and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013

correlations in inverse ratio to the Employment8 (Employment in agriculture in % of total employment) and ArableLand10 (Arable land in % of land area).

Remittance4 (Personal remittances received in current USD billion) has very strong correlations with Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land) and in inverse ratio to the AgrLand9 (Agricultural land in % of land area). Remittance4 (Personal remittances received in current USD billion) has strong correlations with ArableLand10 (Arable land in % of land area) and in inverse ratio to the Machinery5 (Agricultural machinery, tractors per 100 sq. km of arable land).

Machinery5 (Agricultural machinery, tractors per 100 sq. km of arable land) has very strong correlations in inverse ratio to the ArableLand10 (Arable land in % of land area), and weak correlations with AgrLand9 (Agricultural land in % of land area) and in inverse ratio to the Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land) and Employment8 (Employment in agriculture in % of total employment). Fertilizer6 (Fertilizer consumption in kilograms per hectare of arable land) has very strong correlations in inverse ratio to the AgrLand9 (Agricultural land in % of land area) has middle strong correlations with the ArableLand10 (Arable land in % of land area). Finally, the AGVA7 (Agriculture, value added in % of GDP) has very strong correlations with Employment8 (Employment in agriculture in % of total employment).

According to the Table 3 and Table 4 the population has strong correlations with the changes of the GDP growth, personal remittances received, fertilizer consumption and arable land measure in share of the land area. If the population increases, the above-mentioned economic variables also increase. But if the population increases, the agricultural land measure in share of the land area decreases in cases of five countries, there is an inverse ratio between both of them. If the GDP growth increases the Personal remittances received, Fertilizer consumption increase, but the Agriculture, value added in share of GDP, Employment in agriculture in share of total employment and the agricultural land in share of land area decrease.

When the inflation increases, the agricultural machinery (tractors) increase, but the employment in agriculture and the arable land measure decreased. This means that the cost of machines is at high level, and the farmers purchase expensive machines, the selling price of agricultural products can increase, which increases the inflation rate. Also, if the inflation increases by the increasing purchasing of agricultural machines, the mechanization process decreases the level of the employment in agricultural sector and also the arable land measures, because the fruit and vegetable production will increase.

If the personal remittances received increase, this means that the fertilizer consumption and arable land increase, and the agricultural machinery, tractors and agricultural land decrease. If the agricultural machinery/tractors increase the fertilizer consumption, the employment in agriculture and arable land decreases, but somehow the agricultural land can little increase. If the fertilizer consumption increases, the agricultural land decreases but the arable land can increase. If the employment in agriculture increases the agriculture, the value added as well as can increase.

The Table 5 shows two components set up by economic variances, where the component-1 consists of Population, GDP per capita, Personal remittances received, Fertilizer consumption, (Minus) Agricultural land (% of land area), which varies at principle line "X" in the coordinate system in Figure 1. The component-2 consists of (Minus) inflation, (Minus) agricultural machinery, agriculture, value added (% of GDP), employment in agriculture and arable land measure at principle line "Y". The (Minus) sign with economic variables means that these economic variables are in inverse ratio to the other variables, which are positive and not negative valued variables.

In Figure 1 in coordinate system in the first quarter and in the third quarter the economic variables of the component-1 at the line "X", as Population, GDP per capita, Personal remittances received and Fertilizer

**Table 5** Rotated Component Matrix

	Component	
	1	2
PoPul1	,982	-,012
GDP2	,880	-,437
Inflation3	-,047	-,924
Remittance4	,981	,179
Machinery5	-,459	-,863
Fertilizer6	,981	,065
AGVA7	-,461	,551
Employment8	-,447	,865
AgrLand9	-,859	-,061
ArableLand10	,560	,683

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

Source: World Bank, 2019: World Development Indicators

World Bank, 2019 and Kosovo Agency of Statistics, Agriculture and Rural Development Plan 2010–2013

consumption increase and (Minus) Agricultural land (% of land area) decrease or increase only little in Serbia and Bosnia-Herzegovina. But at principle line "Y" in the first quarter, the component-2 consists of agriculture, value added (% of GDP), employment in agriculture and arable land measure, which increase or little decrease but the (Minus) inflation, (Minus) agricultural machinery decrease or little increase in Serbia.

But in the third quarter at principle line "Y" in the first quarter, the component-2 in Bosnia-Herzegovina the agriculture, value added (% of GDP), employment in agriculture and Arable land measure decrease or little increase, but the (Minus) inflation, (Minus) agricultural machinery increase or little decrease, because the line "Y" under the Zero point is minus, but because the economic variables are minus, therefore in this session these variables became positive valued ones.

In coordinate system in the second quarter and in the fourth quarter the economic variables of the component-1 at the line "X", as Population, GDP per capita, Personal remittances received, Fertilizer consumption decrease and (Minus) Agricultural land (% of land area) increase or decrease only little in Kosovo, Albania and North Macedonia. But at principle line "Y" in the second quarter, the component-2 consists of agriculture, value added (% of GDP), employment in agriculture and Arable land measure, which increase or little decrease but the (Minus) inflation, (Minus) agricultural machinery decrease or little increase in Kosovo and Albania.

But in the fourth quarter at principle line "Y", the component-2 in North Macedonia the agriculture, value added (% of GDP), employment in agriculture and Arable land measure decrease or little increase, but the (Minus) inflation, (Minus) agricultural machinery increase or little decrease, because the line "Y" under the Zero point is minus, but the economic variables are minus, therefore in this session these variables became positive valued ones.

The Figure 2 shows the clustering of five countries into three clusters, namely cluster-1 includes Kosovo and Albania, cluster-2 includes Bosnia-Herzegovina and North Macedonia and cluster-3 includes Serbia, based on

their economic variables as features. The countries classified into a given cluster because they have similar economic features and different one from the other countries according to other clusters.

## Conclusions

In case of Kosovo, the employment in agriculture is at a very high level accompanied with less developed machinery level, in spite of the inflation rate at a low level with a high portion of the agricultural land on total land area compared to the cases of the other neighbouring countries. In order to develop, the international competitiveness of farmers needs the mechanization accompanied with increasing subsidies for farmers. The advanced machinery level can decrease the level of the employment in the agricultural sector in Kosovo, which is necessary for the development of other industrial and service sectors. In addition to the above mentioned difficulties, the farmers of Kosovo have other unfavourable conditions concerning the decreasing subsidies or backwardness of mechanization level. In the neighbouring countries close to Kosovo the agricultural conditions could mostly be similar.

The lack of capital and less educated and skilled employees in agricultural industry result in some economic difficulties for the further prosperity of the sector in Kosovo. The possible solutions for the agricultural industry in Kosovo are for example the development of mechanization, common selling-purchasing of farmers, more activities in agricultural services, secondary activities, increasing the subsidies for farmers, attracting farmers for food manufacturing industries, extending the maintenance-network for the agricultural machines, extending the agricultural advisory network and creation of better credit conditions for farmers.

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